THEREFORE WHAT IS CLAIMED IS:

1. A method of reading binary information stored in a storage medium, comprising

a) providing a storage medium having n memory-centers each with a known position and the memory-centers having substantially the same physical dimensions;

b) accessing said storage medium with an addressing system and measuring for each memory-center a scalar signal intensity I_m emitted from a pre-selected region which is centered on the known position of said memory-center; and

c) extracting the stored binary information by calculating bit values b_n for all memory-centers using an equation $\underline{\mathbf{B}} = \mathbf{C}^{-1}\, \underline{\mathbf{I}} / I_o$, wherein I_o is a predetermined normalizing factor, $\underline{\mathbf{I}} = (I_1, I_2, \ldots, I_n)$ is an array of said scalar intensities for all memory-centers, and $\underline{\mathbf{B}} = (b_1, b_2, \ldots, b_n)$ is an array of bit values, and $\mathbf{C}$ is a predetermined cross-talk matrix of n^2 elements where each element represents a cross-talk between said pre-selected regions.

2. The method according to claim 1 wherein the value of each matrix element is defined as a function of a spacing between memory-centers i and j given by

$$C_{ij} = f(r') = f(|\underline{\mathbf{r}}_i - \underline{\mathbf{r}}_j|) = f(\mathbf{R}_{ij})$$

where $f(r')$ is defined as a cross-talk function, and wherein said cross-talk matrix $\mathbf{C}$ is calculated by applying said cross-talk function to each element of a matrix $\mathbf{R}$ that contains all inter-memory-center spacings $R_{ij} = r' = |\underline{\mathbf{r}}_i - \underline{\mathbf{r}}_j|$.

3. The method according to claim 2 wherein a first row of the matrix $\mathbf{R}$ corresponds to the distances between the first memory-center and all other memory-centers and is calculated using integer combinations of a basis vector $\underline{\mathbf{R}}_{1n} = A_n\underline{a} + B_n\underline{b} + C_n\underline{c}$, and wherein the jth row is calculated by transforming the origin from the first memory-center to the jth memory-center, $|R_{jn}| = |\underline{\mathbf{R}}_{1n} - \underline{\mathbf{R}}_{1j}|$.

4. The method according to claim 2 wherein the cross-talk function $f(r')$ is derived from an intensity distribution within a pre-selected region $I_0(\mathbf{\underline{q}}_m)$,

$$f(r') = \oint d\underline{q} I_0(\underline{q}_i) \cap I_0(\underline{q}_j)$$

where q_m defines coordinates of the intensity distribution of the pre-selected region of the mth memory-center.

5. The method according to claim 1 wherein a binary value for each memory-center is calculated from a corresponding bit value by a process wherein the n_1 highest bit values are assigned a binary value of '1' and all others are assigned a binary value '0' based upon an equation relating the population of '1' valued memory-centers,

$$n_1 = \sum_{j=1}^{N} \frac{Ij}{I_0} = \frac{I_N^{total}}{I_0}$$

6. A method of reading binary information stored in a storage medium, comprising

a) providing a storage medium having n memory-centers each with a known position and the memory-centers having substantially the same physical dimensions;

b) accessing said storage medium with an addressing system and measuring for each memory-center a scalar signal intensity I_m emitted from a pre-selected region which is centered on the known position of said memory-center and having an intensity distribution defined by an impulse response of the addressing system and an effective distribution of the signal stored within the addressed memory-center; and

c) extracting the stored binary information by calculating bit values b_n for all memory-centers using an equation $\underline{\mathbf{B}} = \mathbf{C}^{-1}\, \underline{\mathbf{I}} / I_o$, wherein I_o is a predetermined normalizing factor, $\underline{\mathbf{I}} = (I_1, I_2, \ldots, I_n)$ is an array of said scalar intensities for all memory-centers, and $\underline{\mathbf{B}} = (b_1, b_2, \ldots, b_n)$ is an array of bit values, and $\mathbf{C}$ is a predetermined cross-talk matrix of n^2 elements where each element represents a cross-talk between said pre-selected regions.

7. The method according to claim 6 wherein the intensity distribution within a pre-selected region $I_0(q)$, is calculated as the convolution of the impulse response with the effective distribution of the signal stored within the addressed memory-center, and wherein the value of each matrix element is defined as a function of a spacing between memory-centers i and j given by

$$C_{ij} = f(r') = f(|\underline{r}_i - \underline{r}_j|) = f(\mathbf{R}_{ij})$$

where f(r') is defined as a cross-talk function, and wherein said cross-talk matrix **C** is calculated by applying said cross-talk function to each element of a matrix **R** that contains all inter-memory-center spacings $R_{ij} = r' = |\underline{r}_i - \underline{r}_j|$.

8. The method according to claim 7 wherein intensity distribution is a spatial intensity distribution defined as,

$$I_0(x,y) = I_i(x,y) * S\ (x,y) = \iint I_i(x,y) S\ (x'-x, y'-y) dx'dy'$$

where I_i is a spatial distribution of the impulse response and S is the effective distribution of the signal stored within a memory-center, and wherein the cross-talk function f(r') is derived from the spatial intensity distribution within the pre-selected regions $I_0(x,y)$,

$$f(r') = 4 * \int_{r/2}^{R} \int_{0}^{y(x)} Io(x,y) dy dx$$

where R is an effective radius of said spatial intensity distribution.

9. The method according to claim 8 wherein the spatial intensity distribution measured within the pre-selected regions include discrete pixels $I_0(x,y) = I^0_{x,y}$, and wherein the cross-talk function is

$$f(r') = 4 * \sum_{r/2}^{R} \sum_{0}^{y(x)} I^0_{x,y},$$

where R is the effective radius of the spatial impulse response.

10. The method according to claim 6 wherein a binary value for each memory-center is calculated from a corresponding bit value by a process wherein the n_1 highest bit values are assigned a binary value of '1' and all

others are assigned a binary value ‘0’ based upon an equation relating the population of ‘1’ valued memory-centers,

$$n_1 = \sum_{j=1}^{N} \frac{Ij}{I_0} = \frac{I_N^{total}}{I_0}$$

11. The method according to claim 10 wherein a first row of the matrix **R** corresponds to the distances between the first memory-center and all other memory-centers and is calculated using integer combinations of a basis vector $\underline{\mathbf{R}}_{1n} = A_n\underline{a} + B_n\underline{b} + C_n\underline{c}$, and wherein the jth row is calculated by transforming the origin from the first memory-center to the jth memory-center, $|R_{jn}| = |\underline{R}_{1n} - \underline{R}_{1j}|$.

12. The method according to claim 6 wherein the information is stored optically within the memory-centers in the storage medium, and wherein I_m is the total optical intensity within the pre-selected region of the mth memory-center.

13. The method according to claim 6 wherein the information is stored magnetically within the memory-centers in the storage medium, and wherein I_m is the magnetic intensity within the pre-selected region of the mth memory-center.

14. The method according to claim 1 wherein said storage medium is a 1-, 2- or 3-dimensional storage medium.

15. The method according to claim 1 wherein said storage medium is addressed in 1-, 2- or 3-dimensions.

16. The method according to claim 6 wherein the storage medium includes a periodic array of nano-particles, and wherein each memory-center comprises a photosensitive constituent associated with each nano-particle.

17. The method according to claim 1 wherein the storage medium includes a homogeneous optical storage material.

18. The method according to claim 13 wherein the storage medium includes a periodic array of nano-particles, and wherein each memory-center comprises a magneto-sensitive constituent associated with each nano-particle.

19. The method according to claim 7 wherein the storage medium includes a homogeneous optical storage material.

20. The method according to claim 13 wherein the storage medium includes a homogeneous magnetic storage material.

21. The method according to claim 18 wherein said periodic array of nano-particles includes a polymer matrix comprising a three dimensional array of rigid polymeric cores embedded in a substantially transparent shell-forming polymer.

22. The method according to claim 21 wherein said rigid polymeric cores are latex spheres.

23. The method according to claim 16 wherein said photosensitive constituent includes chromophores.

24. The method according to claim 23 wherein said chromophores are fluorescent molecules.

25. A method of reading binary information stored in an optical storage medium, comprising

a) providing an optical storage medium having n memory-centers each with a known position and the memory-centers having substantially the same

physical dimensions;

b) accessing said optical storage medium with an optical addressing system and measuring for each memory-center a total optical intensity I_m emitted from a pre-selected region which is centered on the known position of said memory-center and having an optical intensity distribution within a single pre-selected region $I_0(q)$ defined by a point spread function of the optical addressing system and an intensity distribution of the memory-center itself defined by an optical response of a single memory-center as imaged through an idealized optical addressing system having an infinitely small point spread function; and

c) extracting the stored binary information by calculating bit values b_n for all memory-centers using an equation $\underline{\mathbf{B}} = \mathbf{C}^{-1}\, \underline{\mathbf{I}} / I_o$, wherein I_o is a predetermined normalizing factor, $\underline{\mathbf{I}} = (I_1, I_2, \ldots, I_m, \ldots, I_n)$ is an array of said scalar intensities for all memory-centers, and $\underline{\mathbf{B}} = (b_1, b_2, \ldots, b_n)$ is an array of bit values, and $\mathbf{C}$ is a predetermined cross-talk matrix of n^2 elements where each element represents a cross-talk between said pre-selected regions.

26. The method according to claim 25 wherein the optical intensity distribution within the single pre-selected region $I_0(q)$, is calculated as a convolution of the point spread function of the optical addressing system with the intensity distribution of the memory-center defined by the optical response of the single memory-center as measured through said idealized optical addressing system, and wherein the value of each matrix element is defined as a function of a spacing between memory-centers i and j given by

$$C_{ij} = f(r') = f(|\underline{\mathbf{r}}_i - \underline{\mathbf{r}}_j|) = f(\mathbf{R}_{ij})$$

where $f(r')$ is defined as a cross-talk function, and wherein said cross-talk matrix $\mathbf{C}$ is calculated by applying said cross-talk function to each element of a matrix $\mathbf{R}$ that contains all inter-memory-center spacings $R_{ij} = r' = |\underline{\mathbf{r}}_i - \underline{\mathbf{r}}_j|$.

27. The method according to claim 26 wherein the cross-talk function $f(r')$ is derived from an intensity distribution within the single pre-selected region $I_0(\underline{\mathbf{q}}_m)$,

$$f(r') = \oint d\underline{q} I_0(\underline{q}_i) \cap I_0(\underline{q}_j)$$

where q_m defines coordinates of the intensity distribution of the pre-selected region of the mth memory-center.

28. The method according to claim 26 wherein the optical intensity distribution is a spatial intensity distribution defined as,

$$I_0(x,y) = PSF(x,y) * S\ (x,y) = \iint I_i(x,y) S\ (x'-x, y'-y) dx' dy'$$

where PSF(x,y) is the point spread function of the optical addressing system and S(x,y) is said optical intensity distribution of the single memory-center as measured through said idealized optical addressing system, and wherein the cross-talk function f(r') is derived from the spatial intensity distribution within the pre-selected regions $I_0(x,y)$,

$$f(r') = 4 * \int_{r/2}^{R} \int_{0}^{y(x)} Io(x,y) dy dx$$

where R is an effective radius of the optical intensity distribution.

29. The method according to claim 28 wherein the optical intensity distribution measured optically within the pre-selected regions includes discrete pixels $I_0(x,y) = I^0_{x,y}$, and wherein the cross-talk function is

$$f(r') = 4 * \sum_{r/2}^{R} \sum_{0}^{y(x)} I^0_{x,y} ,$$

where R is the effective radius of the optical intensity distribution.

30. The method according to claim 26 wherein a binary value for each memory-center is calculated from a corresponding bit value by a process wherein the n_1 highest bit values are assigned a binary value of '1' and all others are assigned a binary value '0' based upon an equation relating the population of '1' valued memory-centers given by,

$$n_1 = \sum_{j=1}^{N} \frac{Ij}{I_0} = \frac{I_N^{total}}{I_0}$$

31. The method according to claim 26 wherein a first row of the matrix **R** corresponds to the distances between the first memory-center and all other memory-centers and is calculated using integer combinations of a basis vector $\underline{\mathbf{R}}_{1n} = A_n\underline{a} + B_n\underline{b} + C_n\underline{c}$, and wherein the jth row is calculated by transforming the origin from the first memory-center to the jth memory-center, $|R_{jn}| = |\underline{R}_{1n} - \underline{R}_{1j}|$.

32. The method according to claim 26 wherein said storage medium is addressed in 1-, 2- or 3-dimensions.

33. The method according to claim 26 wherein the storage medium includes a periodic array of nano-particles, and wherein each memory-center comprises a photosensitive constituent associated with each nano-particle.

34. The method according to claim 26 wherein the storage medium includes a homogeneous optical storage material.

35. The method according to claim 33 wherein said periodic array of nano-particles includes a polymer matrix comprising a three dimensional array of rigid polymeric cores embedded in a substantially transparent shell-forming polymer.

36. The method according to claim 35 wherein said rigid polymeric cores are latex spheres.

37. The method according to claim 33 wherein said photosensitive constituent includes chromophores.

38. The method according to claim 37 wherein said chromophores are

fluorescent molecules.

39. The method according to claim 6 wherein said storage medium is a 1-, 2- or 3-dimensional storage medium.

40. The method according to claim 6 wherein said storage medium is addressed in 1-, 2- or 3-dimensions.

41. The method according to claim 25 wherein said storage medium is a 1-, 2- or 3-dimensional storage medium.

42. A method of reading binary information stored in a storage medium, including

providing a storage medium having n memory-centers each with a known position and the memory-centers having substantially the same physical dimensions;

accessing said storage medium with an addressing system and measuring for each memory-center a scalar signal intensity I_m emitted from a pre-selected region which is centered on the known position of said memory-center; and

extracting the stored binary information by calculating bit values b_n for all memory-centers using an equation $\underline{\mathbf{B}} = \mathbf{C}^{-1}\, \underline{\mathbf{I}} / I_o$, wherein I_o is a predetermined normalizing factor, $\underline{\mathbf{I}} = (I_1, I_2, \ldots, I_n)$ is an array of said scalar intensities for all memory-centers, and $\underline{\mathbf{B}} = (b_1, b_2, \ldots, b_n)$ is an array of bit values, and $\mathbf{C}$ is a predetermined cross-talk matrix of n^2 elements where each element represents a cross-talk between said pre-selected regions.